CLAIMS

1. An amplification system employing Raman amplification with a plurality of first-order Raman pumps and at least one second-order Raman pump which amplifies the first-order Raman pumps, the first- and second-order pumps counter-propagating to signal light in an optical fiber, the amplification system comprising:

a plurality of light sources generating pump light of the first- and second-order pumps; and

a modulator unit modulating the pump light of the first- and second-order pumps by using relative timing of the first- and second-order pumps to optimize lateral signal power distribution along the optical fiber.

2. An amplification system employing Raman amplification with a plurality of first-order Raman pumps and at least one second-order Raman pump which amplifies the first-order Raman pumps, the first- and second-order Raman pumps counter-propagating to signal light in an optical fiber, the amplification system comprising:

a plurality of light sources generating pump light of the first- and second-order pumps; and

a modulator unit modulating the pump light of the first- and second-order pumps by using relative timing

of the first- and second-order pumps to allow flattening lateral signal power distribution along the optical fiber.

3. The amplification system according to claim 2, further comprising a light source generating pump light of at least one third-order pump co-propagating with the signal light to amplify the second-order pump.

4. The amplification system according to claim 2, further comprising a light source generating pump light of at least one third-order pump co-propagating with the second-order pump to amplify the second-order pump.

5. The amplification system according to claim 2, wherein the modulator unit controls a temporal shape of modulated pulses of the second-order pump such that pump power of the modulated pulses of the second-order pump overlap with pump power of modulated pulses of the first-order pumps.

6. The amplification system according to claim 5, wherein the modulator unit controls the temporal shape of the pulses such that power transfer from the second-order pump to the first-order pumps is pushed

deeper into the optical fiber.

7. The amplification system according to claim 2, wherein the modulator unit includes driver electronics controlling the relative timing and electrically modulates the pump light of the first- and second-order pumps through the driver electronics.

8. The amplification system according to claim 2, wherein the modulator unit includes optical modulators controlling the relative timing and optically modulates the pump light of the first- and second-order pumps through the optical modulators.

9. The amplification system according to claim 2, wherein the modulator unit controls the relative timing by adjusting at least one of modulation frequencies, duty cycles and temporal offsets of pulses of the first- and second-order pumps.

10. An amplification system employing Raman amplification with a plurality of first-order Raman pumps and at least one second-order Raman pump which amplifies the first-order Raman pumps, the first- and second-order pumps counter-propagating to signal light in an optical

fiber, the amplification system comprising:

a plurality of light sources generating pump light of the first- and second-order pumps; and

a modulator unit modulating the pump light of the first- and second-order pumps by controlling a length of an interaction area in the optical fiber, in which pump power of modulated pulses of the second-order pump overlap with pump power of modulated pulses of the first-order pumps.

11. The amplification system according to claim 10, wherein the modulator unit controls the length of the interaction area by adjusting at least one of modulation frequencies, duty cycles and temporal offsets of pulses of the first- and second-order pumps.

12. An amplification method employing Raman amplification with a plurality of first-order Raman pumps and at least one second-order Raman pump which amplifies the first-order Raman pumps, the first- and second-order pumps counter-propagating to signal light in an optical fiber, the amplification method comprising:

generating pump light of the first- and second-order pumps;

modulating the pump light of the first- and

second-order pumps by using relative timing of the first- and second-order pumps to optimize lateral signal power distribution along the optical fiber; and

launching the first- and second-order pumps in opposite direction to the signal light in the optical fiber.

13. An amplification method employing Raman amplification with a plurality of first-order Raman pumps and at least one second-order Raman pump which amplifies the first-order Raman pumps, the first- and second-order Raman pumps counter-propagating to signal light in an optical fiber, the amplification method comprising:

generating pump light of the first- and second-order pumps;

modulating the pump light of the first- and second-order pumps by using relative timing of the first- and second-order pumps to allow flattening lateral signal power distribution along the optical fiber; and

launching the first- and second-order pumps in opposite direction to the signal light in the optical fiber.

14. An amplification method employing Raman amplification with a plurality of first-order Raman pumps

and at least one second-order Raman pump which amplifies the first-order Raman pumps, the first- and second-order pumps counter-propagating to signal light in an optical fiber, the amplification method comprising:

generating pump light of the first- and second-order pumps;

modulating the pump light of the first- and second-order pumps by controlling a length of an interaction area in the optical fiber, in which pump power of modulated pulses of the second-order pump overlap with pump power of modulated pulses of the first-order pumps; and

launching the first- and second-order pumps in opposite direction to the signal light in the optical fiber.